AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (previously presented) Power electronics for an electrochemical cell system, the power electronics comprising:

a first power converter including:

a plurality of interchangeable power converter modules, each of the modules having a predefined power rating; and

a first expandable motherboard configured to receive the plurality of interchangeable power converter modules, to receive three-phase AC input voltage, and to deliver DC output voltage;

each of the modules is coupled to the first motherboard to receive AC input voltage therefrom and to deliver DC output voltage thereto;

each of the modules have a selectable operating voltage and a voltage balancing device for providing a series or parallel building block for the first motherboard, thereby further enabling the first motherboard to have an expandable power rating;

wherein a power rating of the first power converter is capable of being changed by adjusting a number of the interchangeable power converter modules attached to the first motherboard.

2. (original) The power electronics of Claim 1, further comprising:

a controller configured to adjust a current output from the interchangeable power converter modules attached to the first motherboard.

3. (previously presented) The power electronics of Claim 2, further comprising:

a second power converter including:

a second expandable motherboard configured to receive at least a portion of the plurality of interchangeable power converter modules;

wherein a power rating of the second power converter is capable of being adjusted by changing a number of the interchangeable power converter modules attached to the second motherboard.

4. (previously presented) The power electronics of Claim 3, wherein:

the controller is further configured to adjust a current output from the interchangeable power converter modules attached to the second motherboard; and

the controller is a single controller configured to adjust a current output from each of the interchangeable power converter modules attached to the first motherboard and from each of the interchangeable power converter modules attached to the second motherboard.

5. (original) The power electronics of Claim 4, wherein the first power converter is one of an AC-to-DC converter and a DC-to-DC converter, and the second power converter is one of an AC-to-DC converter and a DC-to-DC converter.

6. (original) The power electronics of Claim 2, wherein each power converter

module in the plurality of power converter modules includes:

a first chopping circuit configured to receive a first DC input and provide a first AC output;

a first transformer configured to adjust a power of the first AC output and provide

a first transformed AC output; and

a first rectifier configured to receive the first transformed AC output and provide a first DC output.

7. (original) The power electronics of Claim 6, wherein the each power converter module in the plurality of power converter modules includes:

a first half-module including the first chopping circuit, the first transformer, and the first rectifier; and

a second half-module including:

a second chopping circuit configured to receive a second DC input and provide a second AC output;

a second transformer configured to adjust a power of the second AC output and provide a second transformed AC output; and

a second rectifier configured to receive the second transformed AC output and provide a second DC output.

8. (original) The power electronics of Claim 7, wherein the first DC output from the first half-module and the second DC output from the second half-module are controlled by the controller.

9. (original) The power electronics of Claim 4, wherein the first motherboard, the second motherboard, and the controller are mounted in a common power converter box.

10. (original) The power electronics of Claim 2, wherein the controller is configured to receive signals from the interchangeable power converter modules attached to the first motherboard, the signals indicating at least one of: an output current, a temperature, a fuse status, an output voltage, an input voltage, and combinations including two or more of the foregoing.

11. (previously presented) An electrochemical cell system, comprising:

a first power source;

an electrochemical cell; and

a modular power electronics system electrically connected between the first power source and the electrochemical cell, the modular power electronics system including:

a first power converter adapted for conditioning electrical current flow between the first power source and the electrochemical cell, the first power converter including:

a plurality of interchangeable power converter modules; and

a first expandable motherboard configured to receive the plurality of interchangeable power converter modules and to receive three-phase AC input voltage, each of the modules coupled to the first motherboard to receive the AC input voltage therefrom and to deliver DC output voltage thereto, each of the modules having a selectable operating voltage and a voltage balancing device for providing a series or parallel building block for the first motherboard thereby enabling the first motherboard to have an expandable power rating;

wherein a power rating of the first power converter is capable of being adjusted by changing a number of the interchangeable power converter modules attached to the first motherboard.

12. (original) The electrochemical cell system of Claim 11 , wherein the modular power electronics system further includes:

a controller configured to adjust a current output from the interchangeable power converter modules attached to the first motherboard.

13. (previously presented) The electrochemical cell system of Claim 12, further comprising:

a second power source, wherein the modular power electronics system is electrically connected between the second power source and the electrochemical cell; and

wherein the modular power electronics system further includes:

a second power converter adapted for conditioning electrical current flow between the second power source and the electrochemical cell, the second power converter including:

a second expandable motherboard configured to receive at least a portion of the plurality of interchangeable power converter modules;

wherein a power rating of the second power converter is capable of being adjusted by changing a number of the interchangeable power converter modules attached to the second motherboard.

14. (original) The electrochemical cell system of Claim 13, wherein the controller is further configured to adjust a current output from the interchangeable power converter modules attached to the second motherboard.

15. (original) The electrochemical cell system of Claim 14, wherein the first power converter is one of an AC-to-DC converter and a DC-to-DC converter, and the second power converter is one of an AC-to-DC converter and a DC-to-DC converter.

16. (original) The electrochemical cell system of Claim 12, wherein each power converter module in the plurality of power converter modules includes:

a first chopping circuit configured to receive a first DC input and provide a first AC output;

a first transformer configured to adjust a power of the first AC output and provide a first transformed AC output; and

a first rectifier configured to receive the first transformed AC output and provide a first DC output.

17. (original) The electrochemical cell system of Claim 16, wherein the each power converter module in the plurality of power converter modules includes:

a first half-module including the first chopping circuit, the first transformer, and the first rectifier; and

a second half-module including:

a second chopping circuit configured to receive a second DC input and provide a second AC output;

a second transformer configured to adjust a power of the second AC output and provide a second transformed AC output; and

a second rectifier configured to receive the second transformed AC output and provide a second DC output.

18. (original) The electrochemical cell system of Claim 17, wherein the first DC output from the first half-module and the second DC output from the second half-module are controlled by the controller.

19. (original) The electrochemical cell system of Claim 14, wherein the first motherboard, the second motherboard, and the controller are mounted in a common power converter box.

20. (original) The electrochemical cell system of Claim 12, wherein the controller is configured to receive signals from the interchangeable power converter modules attached to the first motherboard, the signals indicating at least one of: an output current, a temperature, a fuse status, an output voltage, an input voltage, and combinations including two or more of the foregoing.

21. (original) The electrochemical cell system of Claim 12, wherein the controller is in operable communication with a controller for the electrochemical cell.

22. (previously presented) A method of configuring power electronics for an electrochemical cell system, the power electronics including a first power converter, the

method comprising:

configuring the first power converter such that its power rating is adjustable by changing a number of interchangeable power converter modules attached to a first expandable motherboard of the first power converter;

configuring the first power converter to receive three-phase AC input voltage and to deliver DC output voltage;

configuring each power converter module to receive AC input voltage from the first motherboard and to deliver DC output voltage to the first motherboard;

configuring each power converter module to have a selectable operating voltage and a voltage balancing device for providing a series or parallel building block for the first motherboard, thereby enabling the first motherboard and the first power converter to have an expandable power rating.

23. (original) The method of Claim 22, further comprising:

configuring a plurality of the interchangeable power converter modules attached to the first motherboard such that an associated current output is adjustable using a single controller.

24. (previously presented) The method of Claim 23, wherein the power electronics are housed within a power converter box and include a second power converter, the method further comprising:

configuring the power converter box housing the first motherboard and the single controller such that a second expandable motherboard may be included therein; and

configuring the second power converter such that its power rating is adjustable by changing a number of the interchangeable power converter modules attached to the second motherboard .

25. (original) The method of Claim 24, further comprising:

configuring a plurality of the interchangeable power converter modules attached

to the second motherboard such that an associated current output is adjustable using the single controller.

26. (original) The method of Claim 24, wherein the first power converter is one of an AC-to-DC converter and a DC-to-DC converter, and the second power converter is one of an AC-to-DC converter and a DC-to-DC converter.

27. (original) The method of Claim 23, further comprising:

configuring the interchangeable power converter modules attached to the first motherboard to provide signals to the controller, the signals indicating at least one of: an output current, a temperature, a fuse status, an output voltage, an input voltage, and combinations including two or more of the foregoing.

28. (original) The power electronics of Claim 2, further comprising:

a second power converter including:

at least a portion of the plurality of interchangeable power converter modules attached to the first motherboard, wherein a power rating of the second power converter is capable of being adjusted by changing a number of the interchangeable power converter modules attached to the first motherboard.

29. (original) The electrochemical cell system of claim 12, further comprising:

a second power source, wherein the modular power electronics system is electrically connected between the second power source and the electrochemical cell; and

wherein the modular power electronics system further includes:

a second power converter adapted for conditioning electrical current flow between the second power source and the electrochemical cell, the second power converter including:

at least a portion of the plurality of interchangeable power converter modules

attached to the first motherboard, wherein a power rating of the second power converter is capable of being adjusted by changing a number of the interchangeable power converter modules attached to the first motherboard.

30. (original) The method of claim 22, wherein the power electronics include a second power converter, the method further comprising:

configuring the second power converter such that its power rating is adjustable by changing a number of the interchangeable power converter modules attached to the first in0 motherboard.

31. (previously presented) The electrochemical cell system of Claim 11 , wherein:

the electrochemical cell is an electrolysis cell.

32. (previously presented) The electrochemical cell system of Claim 11 , wherein:

the plurality of interchangeable power converter modules receive a generated grid input voltage from the first motherboard, and provide a programmable output voltage in parallel to the electrochemical cell.

33. (previously presented) The power electronics of Claim 1, wherein:

each of the modules are disposed upon a single circuit board; and

the first motherboard comprises a filter for filtering the received AC input voltage.

34. (new) The power electronics of Claim 1, wherein:

each of the modules is operably coupled to the first motherboard in such a manner as to receive AC input voltage from the first motherboard and to deliver DC output voltage to the first motherboard;

each of the modules have a selectable operating voltage and a voltage balancing

device that allows selection between a series building block and a parallel building block for the first motherboard, thereby further enabling the first motherboard to have an expandable power rating.

35. (new) The electrochemical cell system of Claim 11, wherein:

each of the modules is operably coupled to the first motherboard in such a manner as to receive AC input voltage from the first motherboard and to deliver DC output voltage to the first motherboard;

each of the modules have a selectable operating voltage and a voltage balancing device that allows selection between a series building block and a parallel building block for the first motherboard, thereby further enabling the first motherboard to have an expandable power rating.

36. (new) The power electronics of Claim 7, wherein:

each of the modules is operably coupled to the first motherboard in such a manner as to receive AC input voltage from the first motherboard and to deliver DC output voltage to the first motherboard;

each of the modules have a selectable operating voltage and a voltage balancing device that allows selection between a series building block and a parallel building block for the first motherboard, thereby further enabling the first motherboard to have an expandable power rating; and

the voltage balancing device is electrically coupled to the first-half module and the second-half module in such a manner as to sense and balance input voltages to the first-half module and the second-half module in response to an input voltage to the first-half module being drawn down in response to the first-half module producing output voltage, which tends to increase an input voltage to the second-half module.

37. (new) The electrochemical cell system of Claim 17, wherein:

each of the modules is operably coupled to the first motherboard in such a manner

as to receive AC input voltage from the first motherboard and to deliver DC output voltage to the first motherboard;

each of the modules have a selectable operating voltage and a voltage balancing device that allows selection between a series building block and a parallel building block for the first motherboard, thereby further enabling the first motherboard to have an expandable power rating; and

the voltage balancing device is electrically coupled to the first-half module and the second-half module in such a manner as to sense and balance input voltages to the first-half module and the second-half module in response to an input voltage to the first-half module being drawn down in response to the first-half module producing output voltage, which tends to increase an input voltage to the second-half module.